First Undergraduate Online Course in Mechanical Engineering at SDSU Through D2L

ME241: Engineering Materials

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Presentation Outlines

1. Introduction
2. Multi-media Resources
3. Students' Engagement
4. Course Assessment
5. Conclusions
6. Acknowledgement

1. INTRODUCTION

5 challenges to enhance teaching and learning for Generation Y:

- Creating learning environments that promote active learning, critical thinking, collaborative learning, and knowledge creation.
- Developing 21st century literacy (information, digital, and visual) among students and faculty.
- Reaching and engaging today's learners.
- Encouraging faculty adoption and innovation in teaching and learning with IT.
- Advancing innovation in teaching and learning with technology in an era of budget cuts.

The plan for South Dakota State University embraces the pedagogical challenge of educating the Generation Y, 21st Century learners. The essential elements of the plan are:

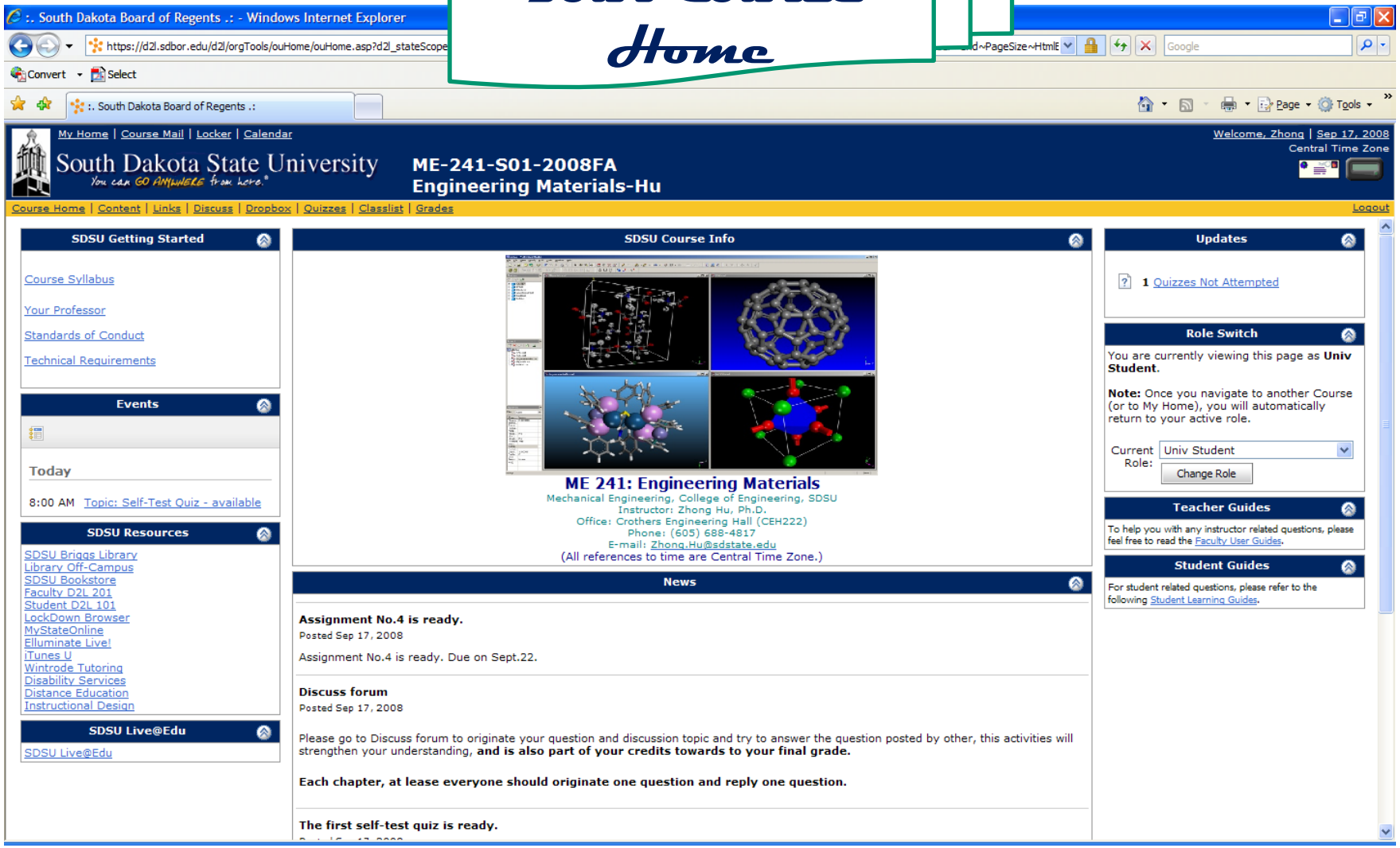
- Create the AL Cloud that enables the active teaching-learning environment (wifi, classroom, devices, virtualization).
- Establish student centered, faculty engage active learning environments based on curricula uniqueness (4-year implementation).
- Empower faculty through in-service programs with the insight, tools and savvy to adopt cutting edge discipline specific pedagogies that will ensure active learning environments (services through Cloud).
- Secure a sustainable resource base to implement and maintain the plan (funding).
- Demonstrate accountability and evaluate the plan outcome (assessment).

- College of Engineering benefiting
- Mechanical Engineering at South Dakota State University is one of the largest undergraduate programs on campus with around 320 undergraduate students enrolled in 2011.
- The Comfort Enrollment of Mechanical Engineering Program is 240, which is 80 students over the program comfort capacity.
- In order to improve the situation and effectively use the AL Cloud resource, one of the strategies is to develop blended/hybrid course learning and delivery.

- Challenges for teaching ME 241: Engineering Materials:
  - The topics, terminology, and even the way of thinking are new to most entry level students.
  - A standard science/engineering approach emphasizing formulae and numerical calculations can leave introductory-level students without a grasp of the basic principles of structure/property/ processing relationships that are at the core of the subject.
  - An understanding of many of the topics requires the visualizations of three-dimensional moving images or evolving processes that cannot be presented effectively using static illustrations.
  - Students, particularly non-materials science and engineering majors, find a traditional lecture series that builds from electrons to atoms to crystals, etc., difficult to absorb.
  - Students typically exit a lecture without real comprehension of what was presented, because they were not able to pass the information from working memory to long-term memory at a rate commensurate with the delivery rate.

2. MULTI-MEDIA RESOURCES

Your Course Home



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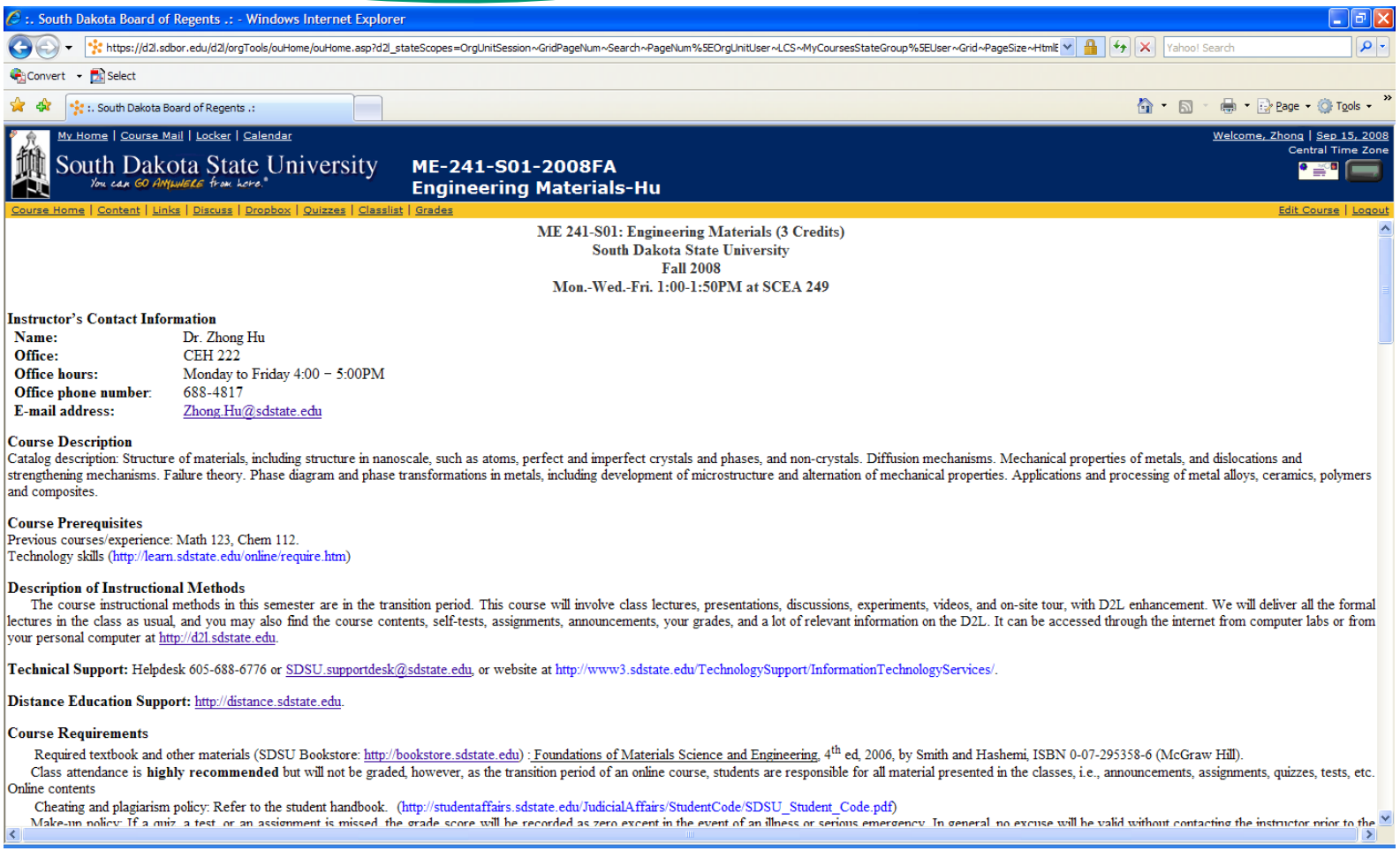
Your Professor

Your Syllabus



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Your Content Details

Course Home | Content | Links | Discuss |

Table of Contents | Print

Bookmarks | Last Topic Visited

Table of Contents

Search For: Search Show Search Options

- Unit1. Course Content
  - i. Chapter 1: Intro
    - I. Objectiv
    - II. 1.1 Int
    - III. 1.2 Hi
    - IV. 1.3 Ma
    - V. 1.4 Ma
    - VI. 1-5 Fu
    - VII. Sumi
    - VIII. Defi
    - IX. Chapt
  - ii. Chapter 2: Ator
    - I. Objecti
    - II. 2.1 Int
    - III. 2.2 A
    - IV. 2.3 El
    - V. 2.4 The
    - VI. 2.5 Bc
    - VII. 2.6 P
    - VIII. 2.7
    - IX. 2.8 Mixed Bonding
    - X. Summary
    - XI. Definitions

Case Study – Material Selection

- **Problem: Select suitable material for bicycle frame and fork.**

Steel and alloys	Wood	Carbon fiber Reinforced plastic	Aluminum alloys	Ti and Mg alloys
Low cost but Heavy. Less Corrosion resistance	Light and strong. But Cannot be shaped	Very light and strong. No corrosion. Very expensive	Light, moderately Strong. Corrosion Resistance. expensive	Slightly better Than Al alloys. But much expensive

Cost important? Select steel
Properties important? Select CFRP

20/20

Definitions and Terminologies

Anion	an ion with a negative charge.
Atom	the basic unit of an element that can undergo chemical change.
Atomic mass unit (amu)	mass unit based on the mass of exactly 12 for $^{12}_{6}C$.
Atomic number	the number of protons in the nucleus of an atom of an element.
Atomic orbital	the region in space about the nucleus of an atom in which an electron with a given set of quantum numbers is most likely to be found. An atomic orbital is also associated with a certain energy level.
Avogadro's number	6.023×10^{23} atoms/mol; the number of atoms in one relative gram-mole or mole of an element.
Cation	an ion with a positive charge.

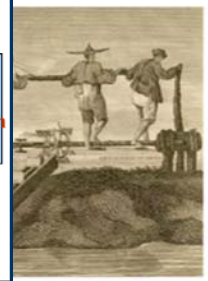
primary bond resulting from the sharing of electrons. In most cases the valent bond involves the overlapping of half-filled orbitals of two oms. It is a directional bond. An example of a covalently bonded aterial is diamond.

e distribution of all the electrons in an atom according to their atomic bitals.

roup of electrons with the same principal quantum number *n*

1-2 Historical Perspective

y segment of our everyday lives is influenced to one degree or another by cally, the development and advancement of societies have been intimately tied ability to produce and manipulate materials to fill their needs. In fact, early been designated by the level of their materials development.



Pump — Wood (Left)

n endless circulating chain bearing square pallets which hold water, earth, or sand. According to some historical articles, it's around the first century BC.

Wheel Barrow (Right)

The Wheel barrow: China, First Century BC. The oldest surviving picture, a frieze relief from a tomb-shrine in Szechuan province, dates from about 118 AD.

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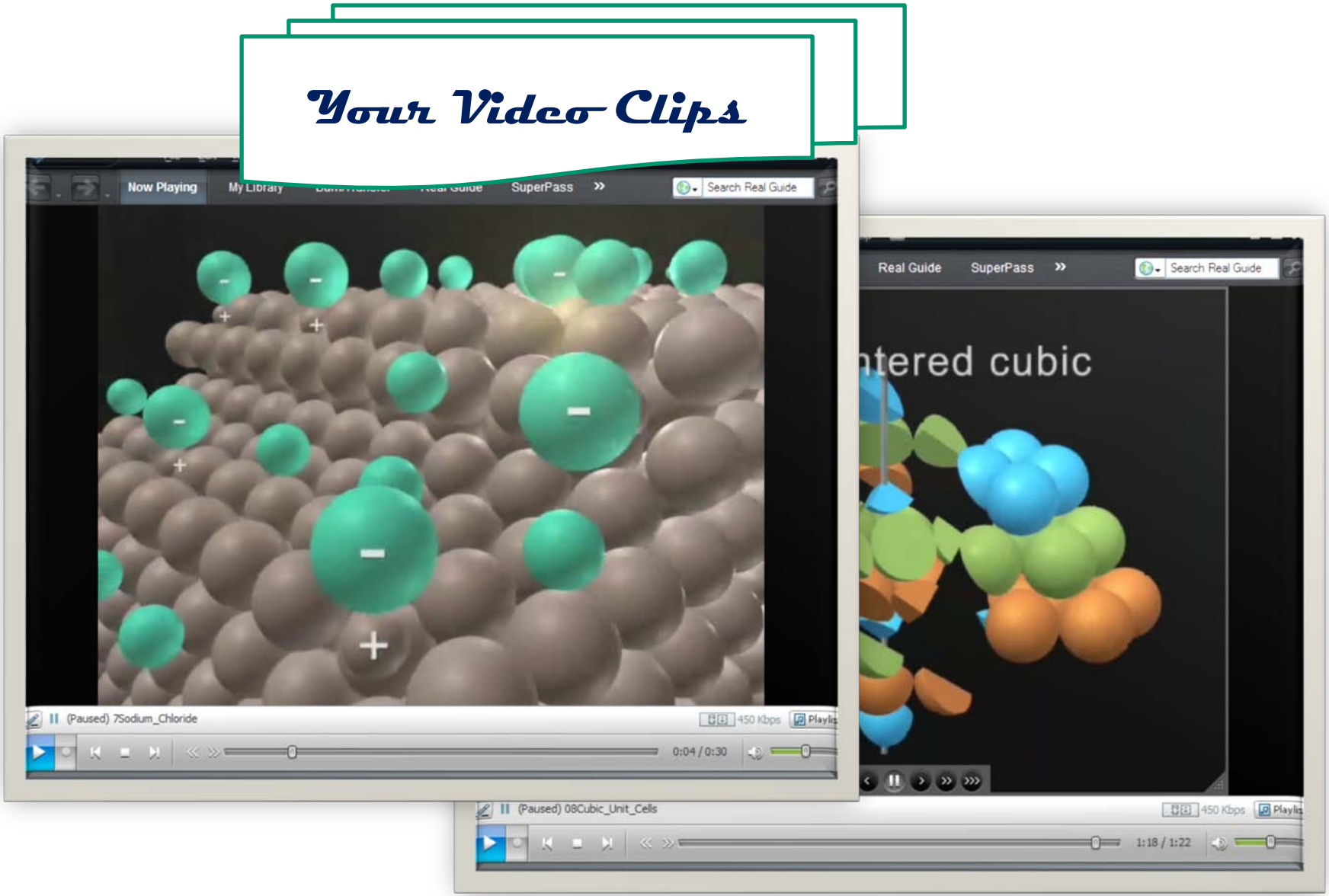
Your Video Clips



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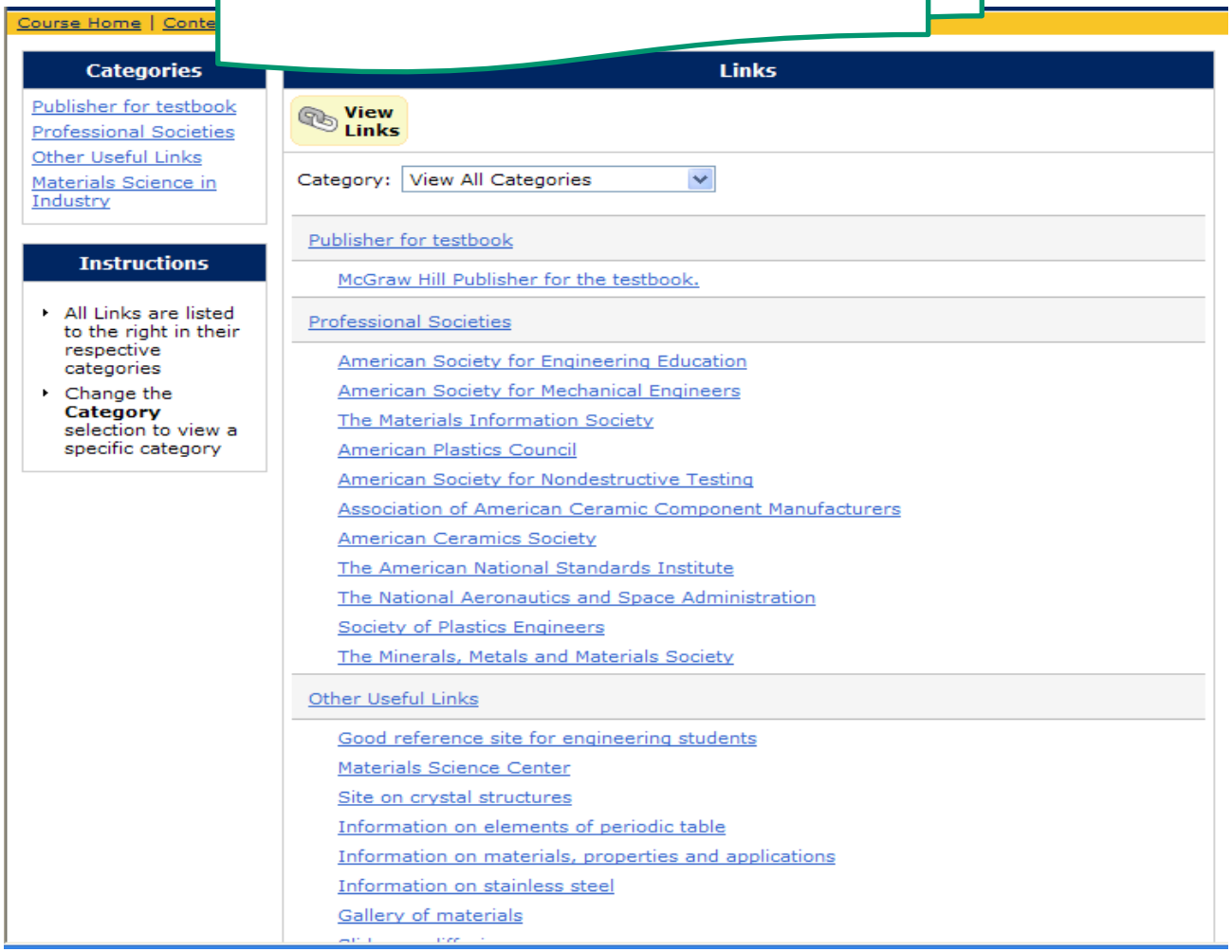
Your Web-links



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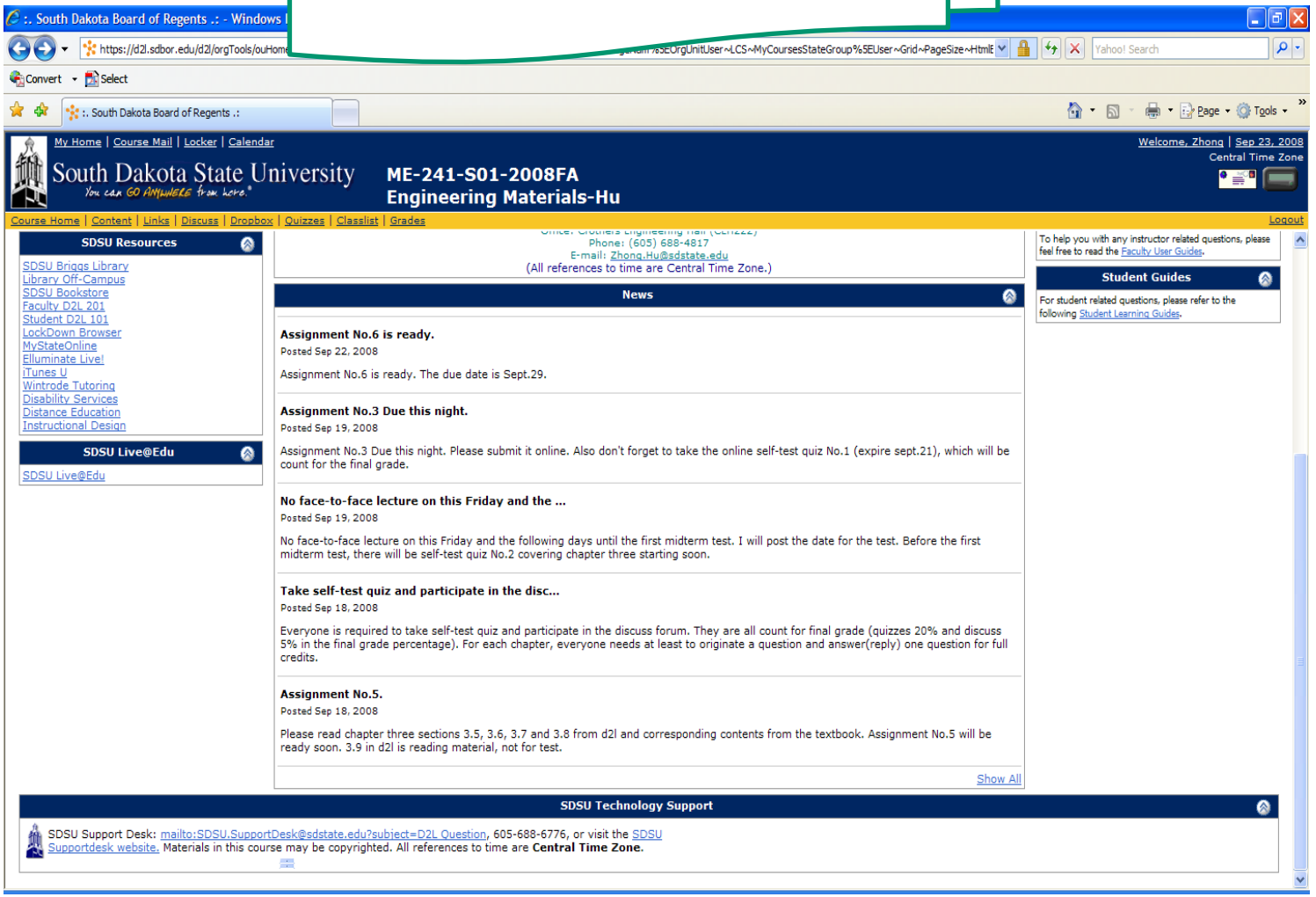
3. STUDENTS' ENGAGEMENT

Your News Board



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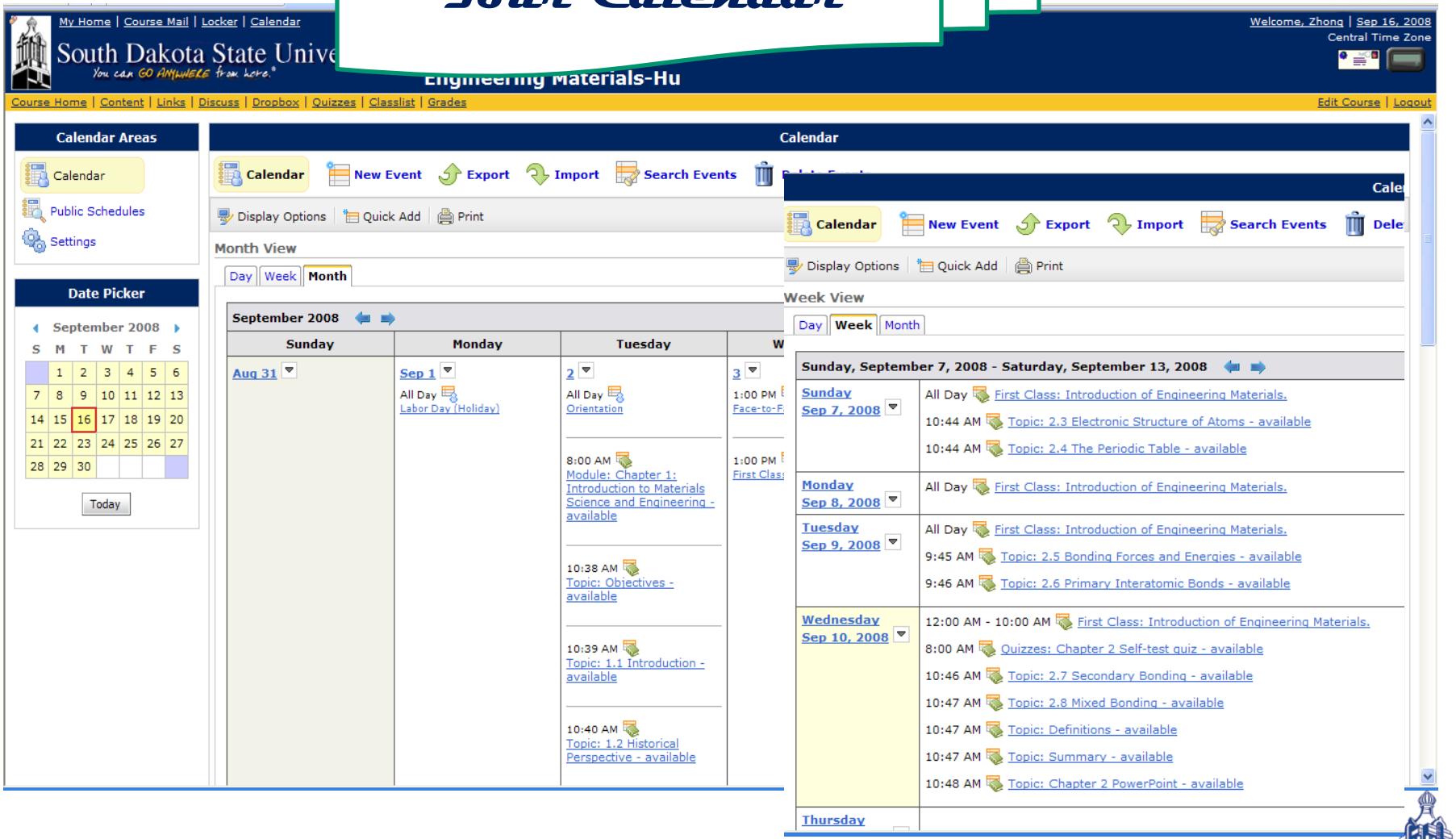
Your Calendar



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Your Assignments

Folder List | New Folder

Dropbox Folders

Folder	Total Files	Unread Files	Flagged Files	Actions
Assignments				
Assignment No.1	36	0	0	
Assignment No.2	30	0	0	
Assignment No.3	35	1	0	
Assignment No.4	31	0	0	
Assignment No.5	41	0	0	
Assignment No.6	32	0	0	
Assignment No.7	6	6	0	
Assignment No.8	1	1	0	

20 per page

Apply | Search | Hide Search Options

Last Name | everyone | show users with unread submissions

Submission after: September 9 2008 Now

Submission before: September 16 2008 Now

everyone

50 per page

Files	Submission Date	Delete
		Leave Feedback
1_BA.doc (289.5 KB)	Sep 12, 2008 1:37 PM	
		Leave Feedback
Assignment1.docx (121.69 KB)	Sep 12, 2008 4:56 PM	
		Leave Feedback

Dustin Artz

$$\frac{(1.6\times10^{-19})^2}{(4\pi)(8.85\times10^{-12})[(.196+.133)\times10^{-9}]^2}$$

2-39. Calculate the net potential energy for K^+Br^- pair by using the b constant calculated from problem 2.37.

From equation 2.8:

$$E_{net} = \frac{+Z_1 Z_2 e^2}{4\pi\epsilon_o a} + \frac{b}{a^n}$$

$$2.12665^{-9} N = \frac{9.5b}{(3.28\times10^{-10})^{10.5}} \quad b = 5.84316\times10^{-110}$$

$$\frac{(+1)(-1)(1.6\times10^{-19} C)^2}{4\pi(8.85\times10^{-12} c^2/N\cdot m^2)(3.28\times10^{-10} m)} + \frac{(5.843\times10^{-110} N\cdot m^{10})}{(3.28\times10^{-10} m)^{9.5}} = E_{K+Br-} = -6.28\times10^{-19} J$$

Page: 1 of 2 | Words: 300 | 100%

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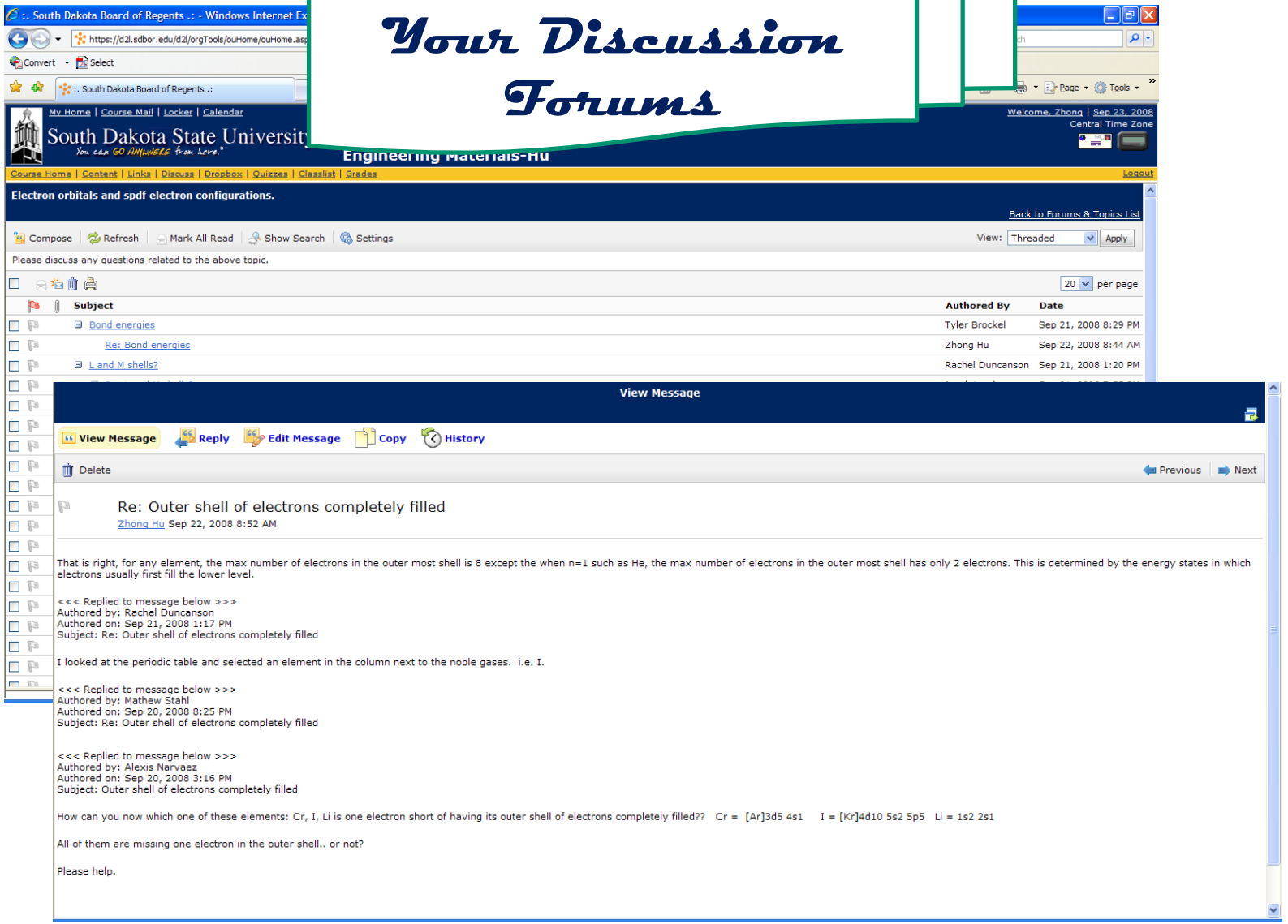
Your Discussion Forums



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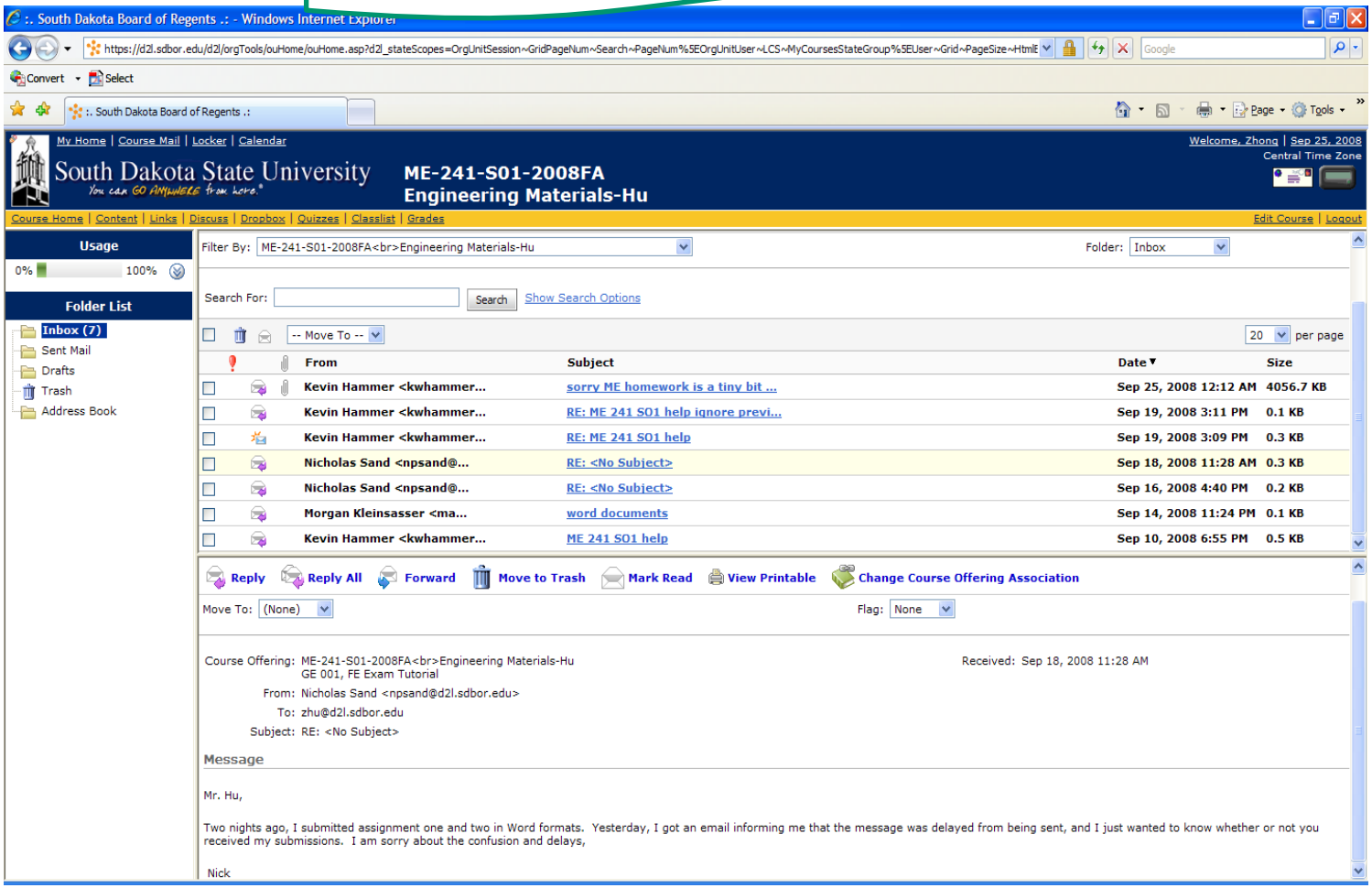
Your Email Box



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4. COURSE ASSESSMENT

Your Quiz

Chapter 2

Est. Length: 0:50:00 **Time Taken:** 0 min

Quiz Info

Zhong Hu
Attempt 1

Questions

Page 1:

1 2 3 4 5
6 7 8 9 10
11 12 13 14 15
16 17 18 19 20

Legend

- Saved Response
- Unsaved Response
- Info Item

Quiz Status

Quiz Started

Please Note: It is recomm

Question 1

The nucleus of an atom c

- A. Protrons
- B. Electrons
- C. Neutrons
- D. All of the above
- E. Both A and C

Question 2

What type(s) of electron su

- *d*
- *p*
- *f*
- *s*
- *s* and *f*
- *s* and *p*
- All of the above

M
/ 1 (autograded)
uestion feedback
question feedback has been set

Question 2

What type(s) of electron subshell(s) does an L shell contain?

- *d*
- *p*
- *f*
- *s*
- *s* and *f*
- ✓ *s* and *p*
- All of the above

Save Time: 3:35 PM
Score: 1 / 1 (autograded)
Expand question feedback
question feedback has been set

Question 3

How many atoms or molecules are there in a mole of a substance?

- 6.023×10^{-23}
- ✓ 6.023×10^{23}
- 1.66×10^{23}
- 1
- 1.66×10^{-23}

Save Time: 3:35 PM
Score: 1 / 1 (autograded)
Expand question feedback
question feedback has been set

Question 4

What is the *maximum* number of electrons that an M shell may contain?

- ✓ 18
- 8
- 2
- 32

Save Time: 3:35 PM
Score: 1 / 1 (autograded)
Expand question feedback

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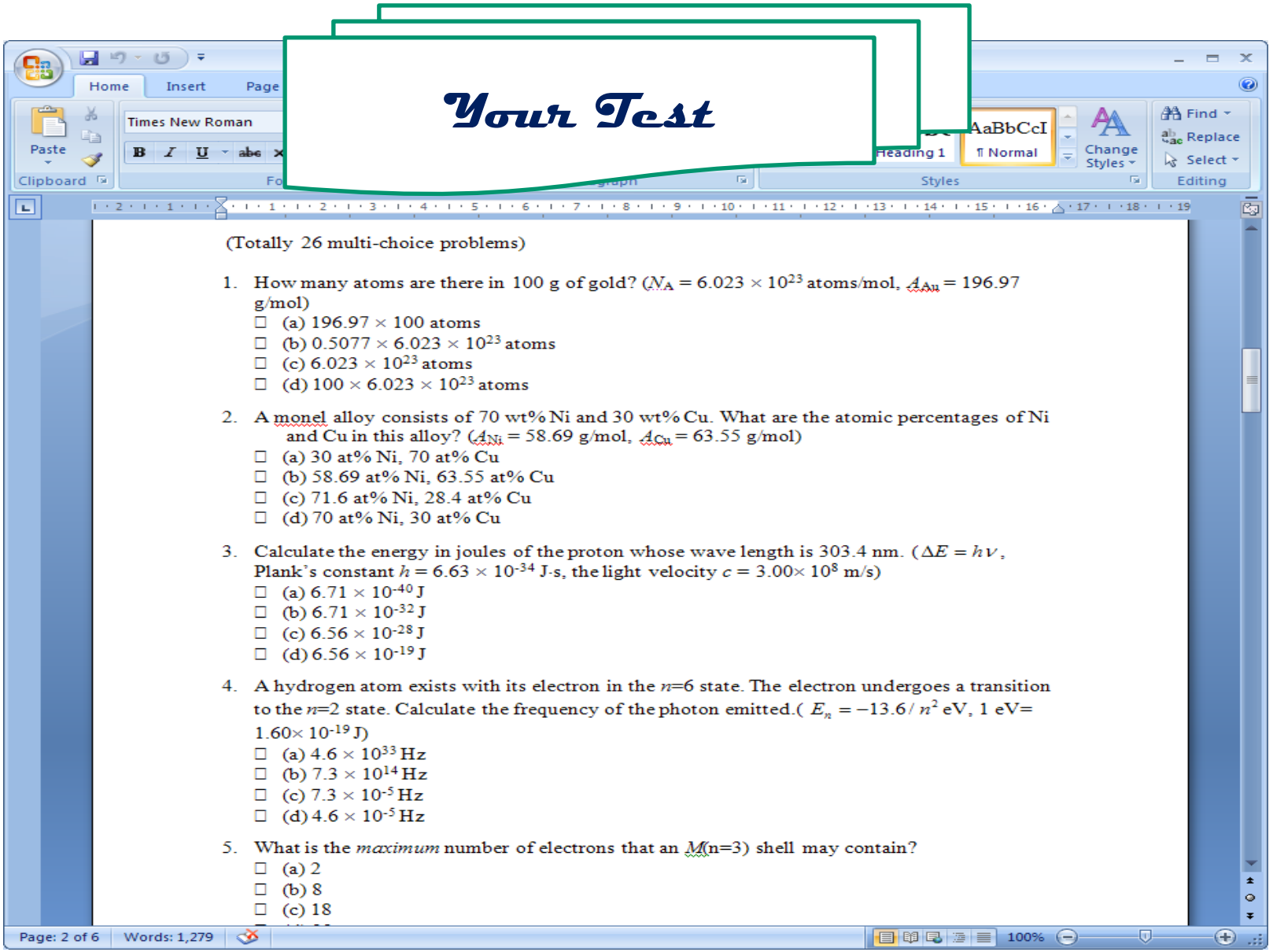
Your Test
Home
Insert
Page
Times New Roman
Paste
Clipboard
Heading 1
AaBbCcI
Normal
Change Styles
Styles
Find
Replace
Select
Editing
(Totally 26 multi-choice problems)
1. How many atoms are there in 100 g of gold? ($N_A = 6.023 \times 10^{23}$ atoms/mol, $A_{Au} = 196.97$ g/mol)
☐ (a) 196.97×100 atoms
☐ (b) $0.5077 \times 6.023 \times 10^{23}$ atoms
☐ (c) 6.023×10^{23} atoms
☐ (d) $100 \times 6.023 \times 10^{23}$ atoms
2. A monel alloy consists of 70 wt% Ni and 30 wt% Cu. What are the atomic percentages of Ni and Cu in this alloy? ($A_{Ni} = 58.69$ g/mol, $A_{Cu} = 63.55$ g/mol)
☐ (a) 30 at% Ni, 70 at% Cu
☐ (b) 58.69 at% Ni, 63.55 at% Cu
☐ (c) 71.6 at% Ni, 28.4 at% Cu
☐ (d) 70 at% Ni, 30 at% Cu
3. Calculate the energy in joules of the proton whose wave length is 303.4 nm. ($\Delta E = h\nu$, Plank's constant $h = 6.63 \times 10^{-34}$ J·s, the light velocity $c = 3.00 \times 10^{8}$ m/s)
☐ (a) 6.71×10^{-40} J
☐ (b) 6.71×10^{-32} J
☐ (c) 6.56×10^{-28} J
☐ (d) 6.56×10^{-19} J
4. A hydrogen atom exists with its electron in the n=6 state. The electron undergoes a transition to the n=2 state. Calculate the frequency of the photon emitted.($E_n = -13.6/n^2$ eV, 1 eV= 1.60×10^{-19} J)
☐ (a) 4.6×10^{33} Hz
☐ (b) 7.3×10^{14} Hz
☐ (c) 7.3×10^{-5} Hz
☐ (d) 4.6×10^{-5} Hz
5. What is the *maximum* number of electrons that an *M*(n=3) shell may contain?
☐ (a) 2
☐ (b) 8
☐ (c) 18
Page: 2 of 6
Words: 1,279
100%

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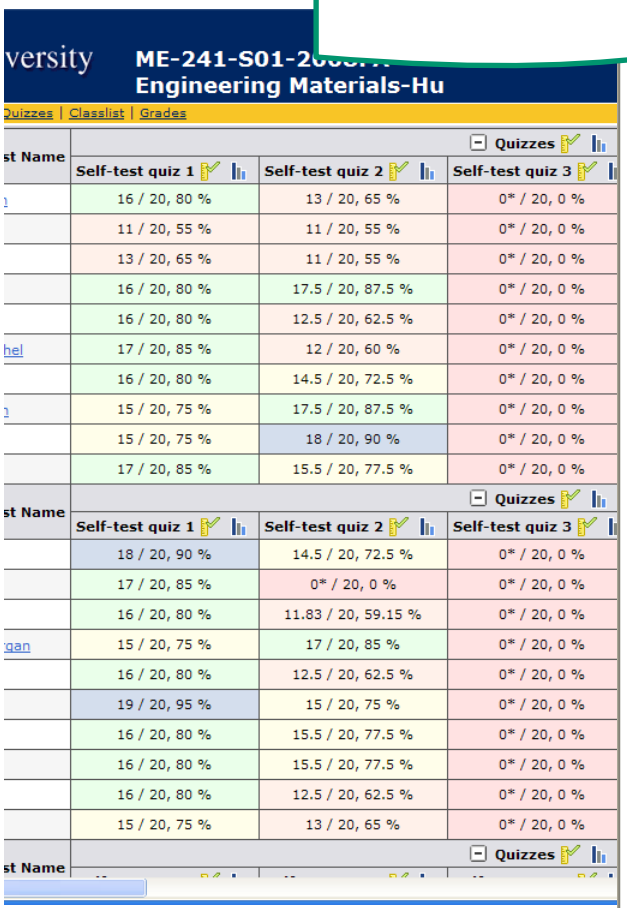
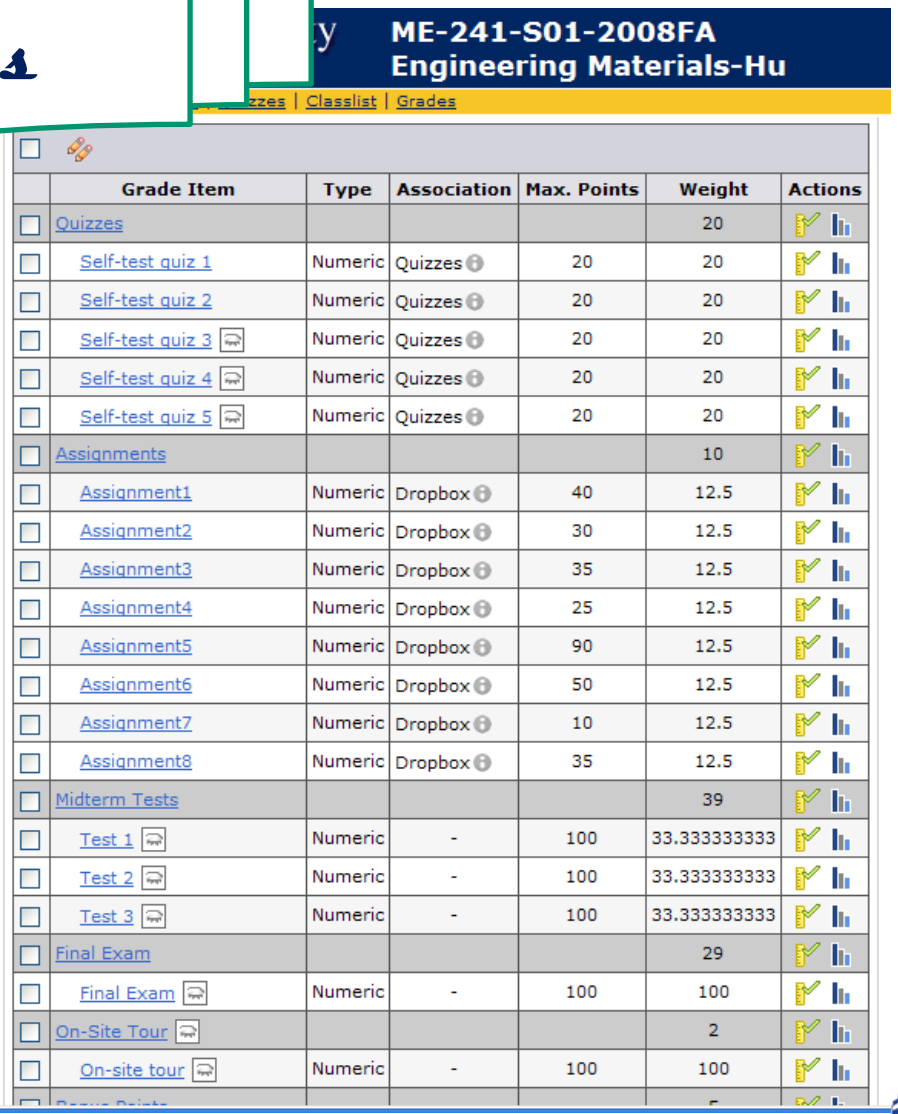
Your Grades



Instructions

- The Grades tool is used to create grade items and schemes for measuring users' performance; record grades; and share a grade book and statistics with users.
- Use this page to view, create, edit, and delete grade items and categories.



Grade Item	Type	Association	Max. Points	Weight	Actions
Quizzes				20	
Self-test quiz 1	Numeric	Quizzes	20	20	
Self-test quiz 2	Numeric	Quizzes	20	20	
Self-test quiz 3	Numeric	Quizzes	20	20	
Self-test quiz 4	Numeric	Quizzes	20	20	
Self-test quiz 5	Numeric	Quizzes	20	20	
Assignments				10	
Assignment1	Numeric	Dropbox	40	12.5	
Assignment2	Numeric	Dropbox	30	12.5	
Assignment3	Numeric	Dropbox	35	12.5	
Assignment4	Numeric	Dropbox	25	12.5	
Assignment5	Numeric	Dropbox	90	12.5	
Assignment6	Numeric	Dropbox	50	12.5	
Assignment7	Numeric	Dropbox	10	12.5	
Assignment8	Numeric	Dropbox	35	12.5	
Midterm Tests				39	
Test 1	Numeric	-	100	33.333333333	
Test 2	Numeric	-	100	33.333333333	
Test 3	Numeric	-	100	33.333333333	
Final Exam				29	
Final Exam	Numeric	-	100	100	
On-Site Tour				2	
On-site tour	Numeric	-	100	100	

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STUDENT SURVEY SUMMARY

Survey Items	Semesters		
	Fall 2008	***Spring 2009***	***Fall 2009***
Received/Sent Out Surveys	26/27	26/27	33/36
Do you have e-learning experience in the past?	Yes: 8 (31%) No: 18 (69%)	Yes: 6 (23%) No: 20 (77%)	Yes: 11(33%) No: 22(67%)
What was the most helpful thing about this delivery?	Flexibility: 14 Online resource:17	Flexibility: 14 Online resource:15	Flexibility:13 Online resource:21
What was the least helpful thing about this delivery?	Less f2f class & interaction:19 Others:9	Less f2f class & interaction:14 Others:13	Less f2f class & interaction:22 Others:11
What did you like about the way the course delivered?	Advantages of hybrid: 25 Others: 7	Advantages of hybrid: 25 Others: 4	Advantages of hybrid: 32 Others: 3
Be interested in taking other courses like this one?	Yes: 15 (58%) No: 3 (11%) Maybe: 8 (31%)	Yes: 8 (31%) No: 4 (15%) Maybe: 14 (54%)	Yes: 16 (48%) No: 3 (9%) Maybe: 14 (42%)
Was it more difficult to achieve better grades?	Yes: 14 (54%) No: 12 (46%)	Yes: 14 (54%) No: 12 (46%)	Yes: 17 (52%) No: 16 (48%)

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5. CONCLUSIONS

- A hybrid or blended course requires careful pedagogical redesign, careful redesign of learning contents, learning process consideration, teaching methods and evaluation.
- South Dakota State University is developing an AL Cloud which makes blended/hybrid course redesign possible and more effective.
- This case study indicates that blended/hybrid learning provides a better ideology for the choice of learning methods when different e-learning tools are available for online and in-class dual environment.

6. ACKNOWLEDGMENTS

Special thanks to: Instructional Design Services, AL Cloud Project/Faculty Development and the Office of Academic Affairs at SDSU for the faculty training opportunity and technical support and ASEE Best Practice in Engineering Education Committee for providing the opportunity to present this work. The author would also like to thank SDSU, the College of Engineering, the Department of Mechanical Engineering and the colleagues for supporting developing the online course.

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Questions ?